

Remarks:

Reconsideration of the application is requested.

Claims 52-71 and 78-106 are now in the application. Claims 52-71 and 105-107 are subject to examination and claims 78-104 have been withdrawn from examination. Claims 52 and 59 have been amended. A marked-up version of the claims is shown in the claims section of this amendment. Claims 72-77 have been canceled. Claims 105-107 have been added.

In item 1 on page 2 of the above-identified Office Action, the Examiner objected to claim 52 because of an informality. The Examiner's suggested correction to refer to the "contact element" instead of the "contact area" has been made as part of the revision to claim 52. Claim 52 now refers to "a part integrally formed with said base and extending from said contact area...." Accordingly, the Examiner is requested to withdraw the objection to claim 52.

In item 2 on page 2 of the above-identified Office Action, claims 59 and 61 have been rejected as being indefinite under 35 U.S.C. § 112, second paragraph.

More specifically, with respect to claim 59 the Examiner states that the instant specification does not clearly

describe the "conditions and parameters of the largest bulging of the substrate surface" so that "a dimensional comparison can be made with respect to the length of the contact element as claimed."

Claim 59 has been revised to recite that the substrate surface has a largest bulging area and said contact element has a length that is at least 5% greater than said largest bulging area...." (emphasis added) Support for this change may be found on page 8, lines 1-11 of the instant specification.

It is respectfully submitted that the claim is clear in regard to the feature of the largest bulging (or protruding) area of the substrate surface and that the instant specification adequately describes this feature. One skilled in the art would readily understand that the "largest bulging" of the surface of the substrate (described on page 8, lines 1-11 of the instant specification) refers to an area or portion of the substrate surface that protrudes or sticks out from the surface. Webster's Dictionary defines "bulge" to mean, inter alia, protrude, stick out, or protuberance. One skilled in the art also would readily understand that the claim feature that the "contact element has a length...at least 5% greater than said largest bulging area" means that the element 5 must extend above the substrate surface by such a length that would permit connections to be made to the element 5 notwithstanding

any protrusions or unevenness in the substrate surface. The specification does not have to provide a recipe for making and using the invention. It simply must provide a sufficiently complete description of the invention which, when taken in light of what is already known in the art, will enable one skilled in the art to make and use the described invention, which applicants submit the instant specification does in fact do.

In respect of claim 61, the Examiner states that "it is not clear from the description in the specification what conditions and parameters are referred to define 'maximum thermal cycling' (recited in the claim) so that a dimensional comparison can be made with respect (to) the length for the claimed elements."

Applicants respectfully submit that the claims and specification of the instant application adequately recite and describe this feature of the present invention and that no further revision of claim 61 is necessary.

The claimed feature relating to "maximum thermal cycling" is described on page 8, line 13 to page 9, line 3 of the instant specification. As discussed above relative to claim 59, the instant specification need not provide a recipe for making and using the present invention. It is respectfully submitted

that the instant specification describes the invention in full, clear, and concise terms to enable one skilled in the art to which the invention pertains to make and use the same. Moreover, it is further submitted that one skilled in the art would understand the feature relating to "maximum thermal cycling" when considered in the context of the instant specification and what is known in the industry and prior art. Therefore, no change has been made to claim 61 regarding the limitation.

It is accordingly believed that the claims meet the requirements of 35 U.S.C. § 112, second paragraph. The above noted changes to the claims are provided solely for the purpose of satisfying the requirements of 35 U.S.C. § 112. The changes are neither provided for overcoming the prior art nor do they narrow the scope of the claim for any reason related to the statutory requirements for a patent.

In item 3 on page 3 of the above-identified Office Action, claims 52-58, 60, 63, and 64 have been rejected as being anticipated by Loro (U.S. Patent No. 3,825,353) under 35 U.S.C. § 102(b).

The rejection has been noted and independent claim 52 has been amended in an effort to even more clearly define the invention of the instant application. Support for the changes is found

on page 30, lines 5-17 of the instant specification and in Figs. 1 and 2 of the drawings of the instant application.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 52 calls for, *inter alia*, an electronic device, comprising:

a substrate having a surface; and

an electronic circuit having interconnects formed on said surface of said substrate;

said electronic circuit including at least one microscopically small contact area;

said contact area including a microscopically small contact element disposed thereon having a base and a part integrally formed with said base and extending from said contact area in three dimensions in a direction deviating from a direction parallel to said electronic circuit on said substrate, said part extending from said contact area being angularly disposed relative to said substrate in an unstressed condition.

According to the present invention there is provided an electronic component having at least one microscopically small

contact area and a method for producing it, which makes it possible to simultaneously produce a multiplicity of contacts, which are suitable both for compensating real unevennesses in the substrate surface and for enabling expansion compensation in the event of thermal cycling of an electronic device.

To that end, the electronic device comprises a contact area, which has a three-dimensionally extending microscopically small contact element which is connected to the contact area in one piece and integrally.

Such an electronic device has the advantage that its contact area with the three-dimensionally extending microscopically small contact element can be realized simultaneously for a multiplicity of integrated circuits on a wafer. Furthermore, this electronic device has the advantage that, for test purposes, a test head with correspondingly arranged contact connection areas on an intermediate carrier can simultaneously make contact with the three-dimensionally extending microscopically small contact elements, without a bonded connection already having to be produced. As a result, it is advantageously possible to test the electronic devices prior to encapsulation in a plastic housing directly on a wafer without rewiring and the need for an intermediate carrier.

The electronic device according to the present invention, with its contact areas which additionally carry a three-dimensionally extending microscopically small contact element, can compensate all expansion differences between the electronic circuit having interconnects on the surface of a substrate or semiconductor and the intermediate carrier belonging to the housing. This avoids conventional form-flexible contact connection lugs between microscopically small contact areas on the surface of the substrate and contact connection areas on an intermediate carrier. Furthermore, this electronic device has the advantage that the three-dimensionally extending microscopically small contact elements can compensate unevennesses of the surface of the substrate. Also, it is possible to compensate for tolerances of a distance between the surface of the substrate and the contact connection areas arranged on the surface of an intermediate carrier, by virtue of the three-dimensionally extending microscopically small contact pins.

The Loro reference does not show or teach a "contact area including a microscopically small contact element disposed thereon having a base and a part integrally formed with said base and extending from said contact area in three dimensions in a direction deviating from a direction parallel to said electronic circuit on said substrate, said part extending from said contact area being angularly disposed relative to said

substrate in an unstressed condition device" according to the present invention.

In Loro, the beam lead 2 rests on the substrate in an unstressed condition. The lead 2 is constructed to allow for upward movement of the beam to accommodate tensile bending forces. The beam lead can flex with compression forces only after these forces have moved the free end of the beam lead upwards. See column 3, lines 54-60.

The beam lead of Loro is not only constructed differently from the contact element of the present invention, it is also unable to achieve the advantages which are obtained by the claimed invention. According to the present invention, the contact elements extending at an angle from the substrate in an unstressed condition allow for the detachable placing of a test head, and subsequently, in the same arrangement, for connection with other circuit boards, for instance by soldering. An electronic device according to the present invention has the aforescribed dual purpose, which accommodates in both cases dimensional irregularities. Loro does not teach or disclose achieving these objectives and advantages. It is respectfully submitted that Loro does not teach or disclose configuring the contact elements with a base and an extended part (with an oblique angle in a preferred embodiment) in an unstressed condition as recited in

independent claim 52. New independent claim 105 contains similar limitations, in addition to specifying that the contact element has a pin configuration and a particular diameter. New dependent claim 106 recites that the contact element has a pin configuration and new dependent claim 107 recites that the contact element has a free end and a configuration for detachably receiving a test head, neither of which is shown or taught by Loro.

Clearly, Loro does not show "said contact area including a microscopically small contact element disposed thereon having a base and a part integrally formed with said base and extending from said contact area in three dimensions in a direction deviating from a direction parallel to said electronic circuit on said substrate, said part extending from said contact area being angularly disposed relative to said substrate in an unstressed condition", as recited in claim 52 of the instant application. Claim 105 contains similar limitations.

Additionally, Loro does not show or teach any or all of the following features: "said contact element being configured as a contact pin having a diameter which is not greater than half of said shortest linear dimension of said contact area" as recited in claim 105; "said part extending from said base has a substantially pin configuration" as recited in claim 106;

and "said part extending from said base has a free end opposite said base and is configured for detachably receiving a test head" as recited in claim 107.

In item 5 on page 6 of the above-identified Office Action, claims 61 and 62 have been rejected as being unpatentable over Loro (U.S. Patent No. 3,825,353) under 35 U.S.C. § 103(a).

The foregoing discussion and arguments regarding the deficiencies of Loro are equally applicable in the rejection of these claims.

Claims 61 and 62 are deemed patentable for the same reasons advanced for claim 52.

Additionally, in dismissing the features of these claims the Examiner arbitrarily and without adequate basis states that "the determination of parameters such as dimensions...is a subject of **routine experimentation and optimization** to achieve the desired interconnect reliability, bonding strength and yield" (emphasis added) and therefore, such features "would have been obvious to a person of ordinary skill in the art at the time (sic the) invention was made." However, the Examiner only makes a conclusory statement regarding these claim limitations and does not cite any prior art whatsoever to support the conclusions. It is respectfully submitted that

such a rejection for obviousness is improper. The Examiner must show a teaching, motivation, or suggestion in the prior art to support the obviousness rejection, which has not been done in the instant rejection. Therefore, the rejection of claims 61 and 62 is deemed improper.

In item 6 on page 8 of the above-identified Office Action, claims 65-77 have been rejected as being unpatentable over Loro (U.S. Patent No. 3,825,353) in view of Mallik et al. (U.S.A. Patent No. 5,420,461) (hereinafter "Mallik"), Grube et al. (U.S. patent No. 5,525,545) (hereinafter "Grube"), and Khandros et al. (U.S. Patent No. 5,917,707) (hereinafter "Khandros") under 35 U.S.C. § 103(a).

The discussion and arguments relative to Loro as presented above are applicable in the rejection of the claims.

Claims 65-71, claims 72-77 having been canceled, are patentable for the same reasons as claim 52 from which they depend.

Additionally, none of the secondary references applied in the rejection overcome the deficiencies of Loro. Nor has the Examiner cited credible evidence as to why one skilled in the art would select the references and combine them with Loro as suggested by the Examiner. It is submitted that the

Examiner's dismissal of the claimed features as being "routine experimentation and optimization" is improper for at least the same reasons discussed above relative to claims 61 and 62. The Examiner has not shown a teaching, suggestion, or motivation in the prior art to select and combine the references relied on to show obviousness. All the Examiner has done is to select isolated features in the prior art, based on hindsight, and then arbitrarily state that it would be obvious to combine those features with Loro to arrive at the claimed invention. Such a rejection is improper and without proper basis. Following the Examiner's statements would mean that essentially all claimed parameters and dimensional limitations are of no patentable significance, which clearly is not the case.

While Grube, Mallik, and Khandros showing resilient extensions for making electrical connections between a semiconductor chip and another circuit board, the various spring elements shown are not contact elements having a base and an extended part integral therewith.

A contact element integrally formed with the base according to the present invention allows for using particularly thin extended portions in the shape of a pin, which enables such elements to be economically and securely mounted in position

on an electronic circuit. Such advantages are not attainable in the prior art.

For example, Khandros (see Fig. 1) shows extensions in the form of pins with a smaller diameter than their base. However, the elongated metal pin 106 is not integrally formed with the base 103 and has to be mounted on the base with a means for forming an intimate bond (see column 4, lines 59 et seq.).

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 52 and 105. Claims 52 and 105 are, therefore, believed to be patentable over the art. The dependent claims are believed to be patentable as well because they all are ultimately dependent on claim 52.

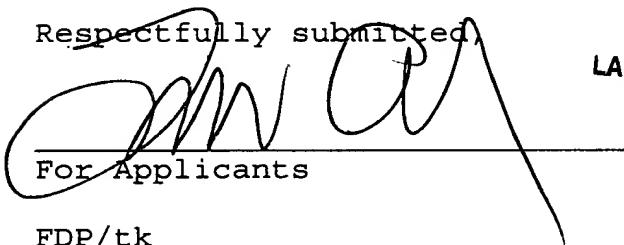
In view of the foregoing, reconsideration and allowance of claims 52-71 and 78-107 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate receiving a telephone call so that, if possible, patentable language can be worked out.

If this paper requires an extension of time, petition for extension is herewith made.

Enclosed herewith is the fee in the amount of \$36.00 for the additional dependent claims. Please charge any other fees that might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,



A handwritten signature consisting of two stylized loops above a horizontal line, with the text "For Applicants" written below the line.

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FDP/tk

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